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# Z( $e\bar{e}$ )+Jets Analysis



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H(Multileptons)

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# Samples

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- **Data:**
  - EM1TRK skim
  - Single EM triggers
  - Run range: 20 April 2002 - 28 June 2004 (Runs 151,817 - 194,566)
  - Rejecting bad runs (CAL, SMT, CFT, Jet/Met, Lumi)
  - $323\text{pb}^{-1}$
  - No T42 applied
  - Jetcorr v5.1
  - Processed with ATHENA (v01-05-02)
- **MC:**
  - $Z/\text{Gamma}^*$  →  $e^+e^- + X$ : 400k Pythia
  - $Z_j \rightarrow ee j$ : 150k Alpgen + Pythia
  - $Z_j \rightarrow ee jj$ : 180k Alpgen + Pythia
  - $Z_{jj} \rightarrow ee jjj$ : 15k Alpgen + Pythia
  - Processed with ATHENA (v01-05-02)



# Selection Criteria

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- Removing bad runs/LBNs & dupli events
- PVX cut:  $|z| < 60\text{cm}$
- Using unprescaled single EM triggers
- Electron selection:
  - $|ID|=10,11$
  - $\text{EMF} > 0.9$
  - $\text{Iso} < 0.15$
  - $\text{HMK}(7) < 12$
  - $p_T > 25\text{GeV}$
  - $|\text{det\_eta}| < 1.1$
  - Including phi cracks
- Z selection:
  - $75\text{GeV} < M_{ee} < 105\text{GeV}$
  - At least one trackmatched electron
  - At least one electron needs to fire the trigger
- Jet selection:
  - $0.05 < \text{EMF} < 0.95$
  - $\text{HotF} < 10$
  - $N90 > 1$
  - $\text{CHF} < 0.4$
  - L1conf
  - JES corrected  $p_T > 20\text{GeV}$
  - $|\text{det\_eta}| < 2.5$
  - Removal of jets overlapping with electrons from Z within  $dR$  of 0.4



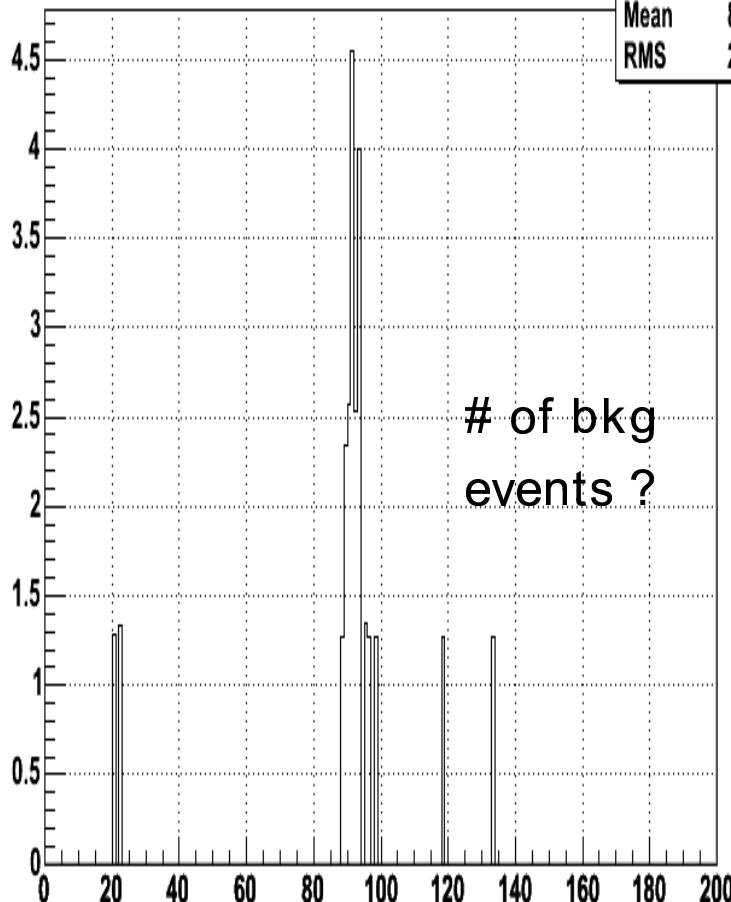
# Technical issues

## Alpgen Zj -> eej: parton multiplicity ?

```
0 parent=-1 ID=1  
E=102.232 Pt=0.299507 Eta=6.52601 Phi=0.59705  
1 parent=-1 ID=-1  
E=33.5669 Pt=1.03544 Eta=4.17162 Phi=1.28933  
2 parent=0 ID=1  
E=98.3419 Pt=0.774269 Eta=5.53742 Phi=2.86248  
3 parent=1 ID=-1  
E=33.5009 Pt=1.0334 Eta=4.17162 Phi=1.28933  
4 parent=-1 ID=21  
E=12.8971 Pt=8.89847 Eta=0.915687 Phi=0.394345  
5 parent=-1 ID=23  
E=118.946 Pt=9.06577 Eta=2.79898 Phi=2.84619  
6 parent=-1 ID=23  
E=118.002 Pt=8.50335 Eta=2.84288 Phi=2.85136  
7 parent=6 ID=11  
E=38.6444 Pt=37.7524 Eta=0.216954 Phi=0.20614  
8 parent=6 ID=22  
E=0.0134265 Pt=0.0129287 Eta=0.27662 Phi=0.278327  
9 parent=6 ID=-11  
E=79.3342 Pt=46.2385 Eta=1.13461 Phi=2.91999  
10 parent=6 ID=22  
E=0.00954396 Pt=0.00523979 Eta=1.20711 Phi=2.8767  
11 parent=-1 ID=3  
E=1.18262 Pt=0.657659 Eta=1.19173 Phi=2.58255  
12 parent=-1 ID=-3  
E=47.6186 Pt=0.652886 Eta=4.98268 Phi=0.559042  
13 parent=-1 ID=2  
E=4.63877 Pt=0.518978 Eta=2.88035 Phi=2.62673  
14 parent=-1 ID=-2  
E=0.525894 Pt=0.519025 Eta=0.162519 Phi=0.514859
```

diem invariant mass (1 track, >= 4 jets)

diem_invmass_1trk_4jet
Entries 18
Mean 88.63
RMS 24.53



# of bkg  
events ?



# Xsection vs Jet Multiplicity

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# jets	0	1	2	3	4
Signal	16,973	2,849	444	60	13
Acceptance	20.9%	21.4%	24%	24.6%	26.1%
<b>Xsection</b>	<b>251 pb</b>	<b>41 pb</b>	<b>6 pb</b>	<b>.75 pb</b>	<b>.15 pb</b>
CDF Run1	231pb	45	9.7pb	2.03pb	.43pb

Closure test for Z(ee) + X in MC:

input xsection = 183pb      -> output xsection = 177pb (179pb)



# todo

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- Pass 2 redo
- Finish Acceptance vs jetmult
- MC closure testing
- Data vs MC improvements
- Correction for jet removal
- MC background estimation
- Jet promotion
- Unsmearing

